KLM Technology Group
#03-12 Block Aronia,
Jalan Sri Perkasa 2
Taman Tampoi Utama
81200 Johor Bahru
Malaysia

PIPING MATERIAL SPECIFICATION

(PROJECT STANDARDS AND SPECIFICATIONS)

KLM Technology Group
#03-12 Block Aronia,
Jalan Sri Perkasa 2
Taman Tampoi Utama
81200 Johor Bahru
Malaysia

PIPING MATERIAL SPECIFICATION

(PROJECT STANDARDS AND SPECIFICATIONS)

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

1.1.1 This specification covers the requirements of materials selected for piping to be used for Company Project.

1.1.2 This specification covers specific requirements for the selection of materials to be used in the construction and fabrication of all process and utility piping systems except the following items;

1) Fabrication ducts, square ducts and other special piping
2) Heating, plumbing, ventilation and similar piping inside buildings
3) Instrumentation tubing

1.1.3 Instrument Piping

This specification does not apply to instrument piping with the exception of the first isolation valve which isolates the instrument from the general piping, or the first two isolation valves when dual isolation valves are specified.

1.1.4 This specification shall be applied to piping materials indicated on piping & instrument diagram (P & ID) and utility flow diagram (UFD).

1.1.5 Limits of the Piping System

This specification applies to the following items when connected to a nozzle located on a piece of equipment:

1) Flanges, gaskets, bolts, and nuts at the equipment nozzle
2) Any valves or blinds connected to the equipment nozzle
3) Piping between the equipment nozzle and the first isolation valve going to an instrument (or second valve if dual isolation is specified)

2.2 CODE AND STANDARDS

1.2.1 All codes and standards specified in this document refer to the latest revision at the time of signing the contract for this project unless otherwise specified.

1.2.2 This specification is based on the American Society of Mechanical Engineers (ASME) Code for Pressure Piping, ASME B31.3, "Process Piping" or ASME B31.1 “Power Piping” (ASME Section I).

1.2.3 Design, fabrication, testing, and inspection of piping materials shall be accomplished in accordance with the applicable codes and standards, which are in effect as of the date contract signed.

1.2.4 Where conflicts between the specification and other drawings, documents, codes, standards and specifications, etc., the most stringent shall be applied.

1.2.5 The code and standards shall be applied below lists, but not limited to the following;

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME B1.1	Unified Inch Screw Threads
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
ASME B16.5	Piping Flanges and Flanged Fittings
ASME B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.10	Face-to-Face and End-to-End dimensions of Valves
ASME B16.11	Forged Fittings, Socket-Welding and Threaded
ASME B16.20	Metallic Gaskets for Pipe Flanges-Ring Joint, Spiral Wounds and Jacketed
ASME B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.25	Buttwelding Ends
ASME B16.34	Valves-Flanged, Threaded, and Welding End
ASME B16.47	Large Diameter Steel Flanges, NPS 26 through NPS 60
ASME B16.48	Line Blanks
ASME B18.2.1	Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	Square and Hex Nuts (Inch Series)

ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe
ASME B46.1	Surface Texture (Surface Roughness, Waviness, and Lay)

AMERICAN BOILER AND PRESSURE VESSEL CODE

ASME Section I	Rules for Construction of Power Boilers
ASME Section II	Materials
ASME Section V	Nondestructive Examination
ASME Section VIII	Rules for Construction of Pressure Vessels
ASME Section IX	Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

AMERICAN PETROLEUM INSTITUTE (API)

ANSI/API SPEC.5L	Specification for Line Pipe
API 594	Check Valves : Flanged, Lug, Wafer and Butt-Welding
API 598	Valve Inspection and Test
API 599	Metal Plug Valves - Flanged and Welding Ends
API 600	Steel Gate Valves – Flanged and Butt-Welding Ends, Bolted Bonnets
API 602	Steel Gate,Globe and Check Valves for Size NPS 4(DN100) and Smaller for the Petroleum and Natural Gas Inustries
API 603	Corrosion-Resistant, Bolted Bonnet Gate Valves-Flanged and Buttwelding Ends
API 607	Fire Test for Soft-seated Quarter-turn Valves
API 608	Metal Ball Valves-Flanged, Threaded, and Welding End
API 609	Butterfly Valves: Double Flanged, Lug- and Wafer-Type

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM	For materials of regular piping part

KLM Technology Group
#03-12 Block Aronia,
Jalan Sri Perkasa 2
Taman Tampoi Utama
81200 Johor Bahru
Malaysia

PIPING MATERIAL SPECIFICATION

(PROJECT STANDARDS AND SPECIFICATIONS)

BRITISH STANDARD (BS)

BS 1868	Steel Check Valves(Flanged and Butt-Welding Ends) for the Petroleum, Petrochemical and Allied Industies
BS 1873	Steel Globe and Globe Stop and Check Valves(Flanged and Butt-Welding Ends) for the Petroleum, Petrochemical and Allied Industies
BS 6364	Valve for Cryogenic Service
BS EN ISO 17292	Metal Ball Valves for Petroleum, Petrochemical and allied industries
BS EN ISO 12266-1	Industrial Valves – Testing of Valves
BS EN ISO 12266-2	Industrial Valves – Testing of Valves

MANUFACTURERS STANDARD SOCIETY (MSS)

MSS-SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS-SP-44	Steel Pipeline Flanges
MSS-SP-75	Specification for High Test Wrought Butt Welding Fittings
MSS-SP-80	Bronze Gate, Globe, Angle and Check Valves
MSS-SP-97	Integrally Reinforced Forged Branch Outlet Fittings-Socket Weldings, Threaded and Buttwelding Ends
MSS-SP-110	Ball Valves, Threaded, Socket Welding, Solder Joint, Grooved and Flanged Ends
MSS-SP-53	Quality Standard for Steel Castings and Forgings for Valves, Flanges,and Fittings and Other Piping Component - Magnetic Particle Examination Method
MSS-SP-54	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Component - Radiographic Examination Method
MSS-SP-93	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Component – Liquid Penetrant Examination Method

DEUTSCHE NORM (DIN)

DIN 30670	Polyethylene Coating for Steel Pipe and Fittings

OTHERS

ISO	International Organization for Standardization
NACE	National Association of Corrosion Engineers
PFI	Pipe Fabrication Institute

1.3 PRESSURE-TEMPERATURE DESIGN

1.3.1 The design pressure-temperature to be used as a basis for the design of piping system and selection of standard piping material components shall be in accordance with the requirements of the ASME B31.3 “Process Piping” or ASME B31.1 “Power Piping” (ASME Section I) or other governing codes.

1.3.2 Design pressure-temperature limitations are in general based on the flange ratings ASME B16.5, ASME B16.47 and are shown on individual line class specifications, unless otherwise noted.

1.3.3 These design conditions shall not be less than the most severe conditions of coincident internal and external pressure and temperature expected during service including start-up, shutdowns, and possible emergency situations (e.g. emergency depressurization, etc).

1.3.4 Unless otherwise specified, piping component wall thickness, specified in the pipe classes are based only on design consideration of pressure, temperature, and allowances for corrosion and minus tolerance according to ASME B31.3 “Process Piping” or ASME B31.1 “Power Piping” (ASME Section I).

1.3.5 Piping component wall thickness do not include additional thickness required to compensate for design considerations such as thermal loads due to restrains, live load, hydraulic shock or load and sources from other caused all of which must be considered in the design of piping systems.

1.3.6 Pipe classes intended for vacuum service or steam service and some pipe classes, especially requested for vacuum design condition, must be verified for vacuum design condition.

1.4 PIPE WALL THICKNESS ALLOWANCE

1.4.1 Wall thickness as determined by design formulas shall be increased to provide for:
1) Corrosion allowance
2) Tolerances for threading and machining, thinning allowance when pipe is to be bent
3) Pipe manufacturer's manufacturing tolerances

1.4.2 Corrosion and erosion allowances are not set forth in the code, but are left to the discretion of the designer. The following corrosion allowances are specified as minimum requirement:

Material	Corrosion Allowance	Remarks
Carbon steel and alloy up to 9 Cr-Mo in dry service	1.6 mm	
Carbon steel and alloy up to 9 Cr-Mo in wet service	3.2 mm	
Galvanized steel	1.6 mm	
Stainless steel	0 mm	
Non-Metal such as GRP, HDPE, PVC, Non-metal lined, etc.	0 mm	

In special cases a greater corrosion allowance may be required. If a higher corrosion allowance for a specific service is specified in any of the specifications, then that corrosion allowance will govern for that service. Likewise, if the Licensor specifies a greater corrosion allowance than that specified in this paragraph or one of the other specifications, then the Licensor's corrosion allowance will govern for that service.

1.4.3 Threading and Machining Tolerances

1) Pipe which is to be threaded shall have an allowance equal to the thread depth added to the calculated wall thickness.
2) For machine surfaces or grooves where the tolerance is not specified, the tolerance shall be assumed to be 0.5 mm in addition to the specified depth cut.

1.4.4 Manufacturing Tolerances

The manufacturers minus tolerance for wall thickness must be added to the calculated wall thickness in accordance with applicable ASTM or API.

1.4.5 Dual Grade Materials

Where dual grade materials i.e 316/316L or 304/304L Stainless steel is available, they shall be used. The corresponding allowable stresses of the higher strength material shall be used in calculating wall thicknesses and the pressure limits of the class.

1.5 ENDS

Unless otherwise specified, the ends shall be to the following standard:

Ends Type	Standard	Remarks
SW / SCRD	ASME B16.11	
BW	ASME B16.25	
Flanged	ASME B 16.5 and ASME B16.47 Series 'B7 Taylor Forge/AWWA	
Threaded	ASME B1.20.1 (NPT, Taper Threads)	

1.6 UNITS

All units are expressed in the international SI system, except for nominal bore sizes of pipes, which are in inches. Pressures are gauge pressures (in bars), unless otherwise stated. Temperatures are in degrees Celsius. Pressure/Temperature ratings of flanges are based on the latest version of the ASME B 16.5 and ASME B16.47.

1.7 LANGUAGE

The language used in drawings, correspondence and other technical document shall be English.

2. MATERIAL

2.1 GENERAL

2.1.1 Piping materials shall be in accordance with ASME B31.3 or where applicable.

2.1.2 Metallic piping shall be used temperature limitation as follows ;

Material	Maximum Design Temperature	Remarks
Carbon Steel	427°C	
P11 (1¼ Cr-½ Mo) Steel	550°C	
P12 (1Cr-½ Mo) Steel	550°C	
P22 (2¼ Cr-1Mo) Steel	550°C	
P91 (9Cr-1Mo-V) Steel	600°C	
Type 304/304L/316/316L/321/347 Stainless Steel	538°C	
Type H Stainless Steel (304H, 316H, etc.)	800°C	
800H (Incoloy)	950°C	

2.1.3 The following pipe sizes shall not be allowed: ⅜, 1¼ , 2½ , 3½ , 5, 7, and 9 inches. However, in cases where the use of these sizes cannot be avoided, the required piping material, fittings, flanges, valves and gaskets shall be the same material as next larger sizes in the applicable piping class.

2.1.4 Material used in the fabrication of piping and piping components shall be new, clean and free from rust, pits and obvious defects.